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AURORAL AND MAGNETIC PERIODS.

[Republished from the *Scientific American* of November 12, 1870.]

MESSRS. EDITORS:—In the *SCIENTIFIC AMERICAN* of Oct. 22, you quote from Prof. Langley the statement, that the magnetic needle moves responsive to the great changes that transpire in the sun; and that our winter sky is lit up by auroras more frequently when the solar action is most violent. The fact, he says, is certain, though the cause is still wholly unknown to science.

We have Prof. Langley for authority, therefore, that the *fact* is establish'd, that auroras depend upon, or are in some way influenced by, physical disturbances in the sun, and that the magnetic needle is also, directly or indirectly, influenced by the same cause. But how this influence is produced, he says, is wholly unknown to science. I may be permitted therefore to attempt a possible explanation, or answer to the question, how do physical changes in the sun produce auroras, and influence the magnetic needle on the earth?

Light and heat are sensations believed to be produced by vibrations of a material substance, the luminiferous ether; and from the known phenomena of light it is inferred that the ether possesses elasticity and inertia but not gravity. We may assume therefore the omnipresence of an inert, elastic and non-gravitating fluid, which will necessarily be less dense within and immediately around revolving bodies than at a distance from them; for, being inert, it will, from centrifugal force, recede from the center of rotation; there will therefore be a continual tendency to the formation of an ethereal vacuum along the axis of rotation, so that equilibrium along the axis of rotation can only be maintained by an in-flowing current of ether from the polar regions of the revolving body. We have, therefore, within and about revolving bodies, not only the phenomena of light and heat from ethereal vibratory motion, but also ethereal motion of translation; and this motion of translation will always be outward about the equator and middle latitudes and inward about the poles. As the earth has a tolerably rapid motion on its axis, we might, *a priori*, be led to expect some tangible indication of such ethereal motion of translation. Have we any such indication? I answer, we have in the phenomena of magnetism and the auroras.

In order that ethereal motion of translation may produce the phenomena of magnetism we assume that, though the vibratory motion of the ether is reflected or absorbed by all opaque bodies, yet in its motion of translation it passes freely through most bodies, but the molecules of a few bodies, such as

iron and steel, may be so arranged that the body is impervious to the ether in one direction and yet will allow its free transit in a direction at right angles with the impervious axis. Let such a body be freely suspended, and, as a vane indicates the direction of a current of air, it will indicate the direction of an ethereal current by its impervious axis assuming a position at right angles with the direction of such current. We have here, therefore, a possible physical cause sufficient to produce the observed phenomena of magnetism.

As obstructions to a current of air will cause vibrations sufficient to produce sound, so obstructions to a current of ether should produce light; and as we have, at all times, an in-flowing current of ether in polar regions, the interference, which it encounters in its passage through the atmosphere, should, and probably does, produce the polar lights, or auroras.

Let it be granted that we have assigned the true cause of magnetism and the polar lights, should we expect these phenomena to indicate great physical disturbance in the sun? In attempting to answer this question I will assume that the ether, though imponderable, is the ultimate state or condition of ponderable matter, and that ponderability, or gravity, is a result of its elastic pressure and vibratory motion, and that it is continually being absorbed, or converted into ponderable matter by the sun. Hence, in the great chemical changes which transpire in the sun and which are manifested by the immense cyclones that are visible, even to the naked eye, at the distance of 95,000,000 miles, I conclude that a vast amount of ether is absorbed by the sun, the result of which must be a motion of translation of the ether in the surrounding space toward the sun; and as the elastic force of the ether is supposed to be in equilibrium with its centrifugal force while the sun is in its normal condition, this increased current toward the sun will diminish its elastic force about the earth, and the centrifugal force will for a time, and until the equilibrium is restored, increase the tendency to a vacuum along the axis and, consequently, increase the polar currents, and we should have the phenomena of auroras and increased magnetic force.

J. E. HENDRICKS.

Proposition. By R. J. ADCOCK.—The resultant in any given direction of the mutual attraction between a unit mass concentrated at a given point and a volume of density δ ,

$$= \delta k_1 \int_b^a S dx,$$

where x = distance from, and S = solid angle subtended at the given point by, a plane sector of the volume perpendicular to the given direction.